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EDITORIAL NOTES

COKE FOR MOTOR TRANSPORT

SINCE 1937, and especially since the beginning of the war, a great deal of experimental work and investigation has been carried out on the use of solid fuel for motor transport in mobile producers. As the volumes of the "JOURNAL" testify, we have throughout followed this work closely. In 1937 we had the setting-up by the Minister for Co-ordination of Defence of the Committee on the Emergency Conversion of Motor Vehicles to Producer Gas; this was followed by the Coal and Carbonization Industries Committee appointed by the Mining Association after consultation with the Mines Department. The work of both these committees was parallel—first the design of a simple producer for the conversion of existing vehicles and capable of rapid mass production; secondly, the supply and use of suitable fuels. Both Committees drew up specifications laying down the characteristics of fuels which could be expected to work satisfactorily in producer gas units of approved types. These specifications were published in the "JOURNAL" in the early part of 1940; and on occasion, both before and since then, we have queried what the Gas Industry's attitude was to the whole problem. In November last the Secretary for Mines invited the Committee which in the previous year considered low-temperature carbonization processes to examine the sources of fuel for producer gas vehicles, to estimate the quantities which could be made available at present, and to report on the measures which would be required to increase the supplies if necessary. We assumed at the time that the problem necessarily involved the availability of producer plants themselves and considerations of what guarantees would be needed, from an economic aspect, to make a long-term policy, as distinct from immediate expediency, desirable or feasible. As far as we are aware, that Committee has not yet made any recommendations.

In the meantime it cannot be said that the petrol situation improves, as, indeed, has been made clear by recent announcements, and the question remains: To what use, and when, are we going to put the large amount of knowledge and experience which has been accumulated on this subject during the past five years—as far as experience goes, particularly during the past two years? We realize that the importance of producer gas as an alternative to petrol was overshadowed by disappointments during the period of enthusiastic development which followed the outbreak of war. It was easy enough to use charcoal, but there is a big difference between using this material and employing solid fuels derived from coal. The task is to use the latter fuels, not charcoal, to replace petrol, and technical difficulties soon showed themselves in the earlier stages of the investigation. We are told, however, that to-day there are quite a large number of vehicles on the road operating on producer gas and giving service which does not compare unfavourably with that given by petrol. We are told, too, that it is now possible to produce in large quantities fuels suitable for gas producers making use of coals available in three-quarters of the coal-producing districts of England, Scotland, and Wales.

We are sure that the Gas Industry could, should it be thought desirable, make a valuable contribution towards availability of supply of suitable solid fuel for the purpose. We think that the need for large-scale action in the preparation and supply of such fuel is manifest, and we should like to see some organization put forward to deal with the matter in a practical way, and means put into effect to make the proposition economically sound and worth while. The field is certainly vast enough. It has been estimated, and, we think, on good grounds, that for heavy duty work and long distance transport, possibly for as much as one-fifth of the commercial transport of the country, producer gas based on coke-fired producers could be used—that it would be a reasonable proposition, technically at all events, to run on producer gas such proportion of the commercial transport of the country as would require a coke consumption of 2,000,000 a year. This is a considerable market, and it has been suggested that it ought to be able to pay a lucrative and attractive price for the coke. It would, of course, relieve us of large imports of oil.

The production in vertical retorts of activated coke and its employment in mobile gas producers have been the subject of considerable study. It has been shown that activated coke, properly graded, of course—and the grading limits, which are fine, have an important bearing on economics and efficient utilization—satisfies the specifications of the Mining Association. And, as we have pointed out before and would emphasize again now, the possible effects of activation on the production of smokeless fuel for the domestic firegrate add to the attraction of the process. It seems to us that there is a demand for producer fuel of the type envisaged, and if the whole proposition is shown in the circumstances of to-day to be necessary in the national interest the Gas Industry, granted adequate coal supplies and availability of plant, would technically have no difficulty in fulfilling it. The proposition is far-reaching. As we have said, regarding the need for action in present wartime circumstances in making available supplies of suitable producer fuel for the heavy duty work envisaged, the case appears to have been substantially proved, and experience may well show the desirability of continuing to operate motor vehicles on home produced solid fuel when the war is over. From this aspect alone the Gas Industry has an important stake. When due weight is given to the collateral possibilities of catering for the domestic solid fuel market by supplying an improved coke, the proposition, it seems to us, assumes a wider significance and still greater importance for the Industry. The time is surely ripe for a lead to be given in the matter.

WHO KNOWS WHAT?

LATELY we have had something to say on the subject of planning, and though as yet we have heard nothing direct from the aloof Post-War Planning Committee of the Gas Industry we shall probably have a good deal more to say before the war is over. To-day we will more or less content ourselves by asking this simple question: Who knows what about the Gas Industry? Until a solution is found to this question we shall flounder. The official bodies have relatively few statistics about it, and what little information they have individually has never, as far as we are aware, been brought together. The capacity of the Industry is largely a mystery; the Board of Trade Returns serve only as a very slight indication or pointer. True, during the past ten years a few voices, including our own small voice, have cried out for the establishment of an organization —which, by the way, need be neither large nor cumbersome— of some type or other the sole purpose of which would be the collation and continuous intelligent analysis of relevant statistics of the Gas Industry. The voices have cried in a parched wilderness. Yet how can the Industry fit in effectively with any national or even regional plan unless it has some knowledge of itself and of its potentialities? The Industry's ignorance of itself is one of its weakest points.

The war has forced upon the Industry many problems, for the incidence of some of which we think we ought to be pro-

foundly grateful. As a simple case, demands have been sprung upon individual undertakings for large quantities of gaseous heat urgently required, for qualities with which, unaided, they could not cope, at any rate with any degree of security. Never has the need for collaboration been made more manifest, and never before has the light shown up more clearly the flaws in what machinery may have existed for putting into speedy effect available resources. To an extent the collaborative spirit has been there, only, however, to move in the dark because the Industry lacks a basis of assessment of its potentialities either nationally or regionally. There ought to be knowledge of what could be done and what could not be accomplished in any given area. This knowledge is the first essential to any form of planning, so we look forward to the setting-up of an information department to collate, analyze, summarize, and keep constantly up to date facts and figures concerning the Gas Industry. The field should cover individual gas undertakings and individual firms making and supplying plant and equipment. Naturally the statistics acquired would have to be intelligently interpreted, but the information must be available, and it is not available to-day. We claim no originality for our plea, but we should like to see the wilderness to which we have referred less arid.

More than once before the war it was put forward that the Gas Industry would make the progress which it could make only if it was possessed of vital information about itself which was then lacking. A bureau of economics was advocated, the purpose of which it was suggested should be to study every phase of the Industry from an economic point of view, to collaborate with government departments in carrying out surveys of domestic and industrial requirements for heat and light, to study the relationship between costs of production and selling prices and the effect of changes in the habits of the consumer. The war has accentuated the need for having information available. We recall that, at the "Press Conference" which the Director-General of Gas Supply called at the end of last year, he made it clear that collation of information was one of the objects of his organization and essential to its work—and the sources available to him in his official capacity must be many. We think that much useful knowledge will by now have accumulated in his files, and, since it has always been his avowed object to work *with* the Industry if the Industry is willing, this would seem to provide an opportunity for rapidly filling some of the gaps in our statistical knowledge.

If it is suggested that we are critical of the work of the Gas Industry Post-War Planning Committee our answer is simply that *officially* we know nothing about its work—that for some reason or another the Committee has adopted a "keep mum" attitude. To our mind this is an unfortunate attitude to adopt if only for the reason that in the outcome its strength must be measured by the support it receives from regions throughout the country, by the aggregate worth of the activities in these regions. Doubtless those in particular districts in the country are looking for guidance and inspiration from the official Gas Industry Committee. We hope that they will not look long in vain.

Fiction and Fact

Even at a time like the present, when there are so many other big, and terrible, problems confronting us, the "bloated capitalist" continues to receive his fair share, or more than his fair share, of attention. He manages still to exist, of course, though beset by the ever-growing attentions of the Income-Tax Collector; but in numbers, the species must find it with the passing of each day more difficult to multiply, in spite of the unceasing efforts of a goodly section of the get-rich-quick fraternity, whose enthusiasm is worthy of a better cause. The hoary head of the big capitalist may not be surmounted by a halo; we are not now concerned to defend him—still less the "profiteer," whose exploits in this gentle land of ours are visited with nothing even remotely resembling that which is their due. But we are anxious that the "bloated capitalist" should not be confused with the "slim investor." Registrars, and others in a position to know, are well aware that holdings in public companies are far more likely to be divided among a large number of small shareholders than among a small number of large ones, but among people who do not pause to make suitable enquiry, there may be a tendency to tar all capitalists with the same brush. It may not be without use, therefore, to quote a little definite evidence on the subject provided by Sir Arthur Robinson, when addressing the proprietors of the Colonial Gas Association, Ltd., of Australia. Referring to "opinions expressed in certain quarters in a somewhat violent manner regarding companies and their profits, whereby a suggestion is sought to be conveyed that every public company is a nefarious institution willing to do anything to secure excessive and wrongful gains," Sir Arthur said that in the Association there are 3,709 shareholders (joint shareholders being counted as one only), and the average capital held by each shareholder is £368. The Association has issued debentures to the face value of £682,000, distributed among 1,510 holders, giving an average investment by debenture holders of £452. Thus the Association is composed of a large number of individuals who have subscribed relatively small amounts to enable a legitimate enterprise to be carried on, and who receive only a moderate return on their investment.

Personal

Mr. A. W. BARNETT, who has been on the Engineering Staff of Messrs. Gibbons Bros., Ltd., Gas Engineers and Contractors, for the past twelve years, has been appointed to the staff of the Mid-Kent Gas Light & Coke Company, Snodland, in succession to Mr. A. Field, who has taken up his position as Engineer and Manager of the Penrith Urban District Council Gas Department.

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Mr. VICTOR J. SMART has been appointed Acting Secretary of the Bognor and District Gas and Electricity Company in place of Mr. F. G. Watson, who has recently retired from his position as Secretary of the Company.

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Mr. WILLIAM WOODCOCK, of Middlesbrough, who has been Chief Inspector of Transport in the Teesside area for the United Automobile Services, Ltd., has been appointed Traffic Superintendent with the Sheffield and District Gas Company.

Obituary

The death occurred on Jan. 25 of Mr. HUGH HENDERSON MACLEOD, Chairman of the Bombay Gas Company, Ltd. He was a Director of the Company for 19 years, of which 16 years were occupied as Deputy Chairman, and he was appointed Chairman on March 26, 1941. He was also a Director of the Oriental Gas Company, Ltd.

* * *

We regret to announce the sudden death, on Jan. 30, following an operation, of Mr. LOUIS THURNER, at the age of 73. He was Managing Director of Falk, Stadelmann & Co., Ltd., which position he held since 1913.

* * *

The death has occurred of Mr. A. J. SLADE, a Director of Kettering Gas Company.

* * *

Mr. HENRY SMITH, who has died at Bingley, Yorkshire, at the age of 71, had been Chairman for some years of Drakes, Ltd., of Halifax.

Letter to the Editor

"Changing a Fashion"

DEAR SIR,—The report of the informative Paper under this heading given by Mr. E. H. Chapelow, Sales Manager of the City of Durham Gas Company, an abstract of which was published in the January issue of the "GAS SALESMAN," re-echoes once more the hope that gas appliances will be fitted in future as a standard in new houses. It is perhaps of interest to note that the first edition of the "JOURNAL OF GAS LIGHTING," dated Feb. 10, 1849, of which I have a copy, puts forward the same plea, thus, in the words of the Editor and Proprietor, Thomas G. Barlow: "We hope at no distant time to see a gas cooking stove and gas fittings as landlords' fixtures in the humble dwellings of the working population of our cities and towns, as well as contributing to the comforts of the mansions of the rich."

There must be some fundamental and deep-rooted reason for this refusal to change on the part of the community over the last century of gas. Is it because of our climate; the easy-to-hand coal plus the cheerful open grate; or the existence of alternative "second strings" in the shape of electricity and coke? Whatever the reason, there is no question that gas appliances have improved enormously, perhaps because of the choice being left largely to the consumers and not to the narrower views which the authorities must exercise. This policy has, I consider, given good results in many other ways of importance to our Industry. Gas undertakings have placed a large part of their

capital outlays on to the consumers, taking useful profits in so doing, at the same time obtaining and retaining more permanent and satisfied customers for gas than they would have if the gas appliances were house fixtures with a tendency to "fix and forget."

Incidentally, the first edition of the "GAS JOURNAL" made what is surely the first call for the grouping of gas undertakings. The Editor asked for one Gas Board to take over the operations of 14 established London gas undertakings. A far-seeing eye.

Yours faithfully,

R. & A. Main, Ltd., 48, Grosvenor Gardens, S.W. 1. H. F. POTTER.

Jan. 27, 1941.

1942 "Journal" Directory

The following changes should be noted in order to keep the Directory up to date:

Page 8. BOGNOR. V. J. Smart, Act. S., *vice* F. G. Watson, retired.
" 12. BRITISH GAS LIGHT, FENNY STRATFORD. Price 13d.++; 14s. 6d. *sl.*
" 14. CANNOCK. T. E. Parry (Fleetwood), E. M. & S.
" 16. CHARD. Tel. 2158. Prices 13d.++; 15.5d.++ *sl.*; up to 40% *disc. i.*
" 56. RADCLIFFE. Tel. Radcliffe 2247, Farnworth 68. Price 13.5d.; 1d. *esl.*; Opt. 2-part, 10s. per qr. *plus* 5.5d. or 9d. per week *plus* 6d.
" 72. UXBRIDGE. J. H. Dyde (North Middlesex), E. & G. M., *vice* C. Hulme, retiring end Feb.
" 78. WORKSOP. K. Wildin, S., *vice* F. Luke, retired.
" 82. BUCKIE. H. G. Keillor, deceased.
" 84. DUNS. A. D. Coubrough (Biggar), M.
" 98. LISBURN. G. M. Niece, M., *vice* A. S. Brook.
" 123. FORBES, N.S.W. Make 7.25. Cons. 359.
" 123. FREEMANTLE, W.A. F. J. N. Taylor, E. Make 100. Cons. 5,771.
" 123. GERALDTOWN, W.A. J. Currie, M., Make 5. Cons. 272.
" 124. HAMILTON, VICTORIA. W. E. Thurgood, S. Make 10. Cons. 767.
" 125. PERTH, W.A. D. A. Ross, E. Make 476. Cons. 27,059.
" 126. SYDNEY, N.S.W. (Australian Gas Light Company. G. W. Woodbridge, Assist. Gen. Man. Make 8,797. Cons. 285,252.
" 139. SCOTTISH JUNIORS (Eastern District). T. B. Livingstone, now Perth.

Fluorescent Lighting

Last week we were afforded the opportunity of being present at a most interesting demonstration of fluorescent lighting, and were impressed by the effective results and the possibilities and many applications of the system—the B.A.B. system, for which Colloidal Research Laboratories, Ltd., 66–70, Petty France, S.W. 1, are responsible. The principle, illumination of a fluorescent substance by rays of light within the ultra-violet region is not new, but it is now possible and practicable to employ such illumination on a commercial scale.

The system consists of painting a surface—for example, a curb, the frame of a doorway, guide lines on the ground, projections from walls, &c.—with a fluorescent paint and illuminating it with light from either a mercury vapour lamp or a white light lamp, from both of which the visible light has been filtered by means of specially designed "black glass" filters which only transmit certain wave-bands in the ultra-violet end of the spectrum. The light itself is invisible, furthermore, its wavelength is not injurious to the eyes, nor does it tan the skin, since the wavelengths range from 3,340 to 4,000 angstrom units. Any light source can be used, including high intensity gas lamps. All can be screened with the "black glass" filters, which will filter out light of wavelengths other than 3,340 to 4,000 angstrom units.

The system appealed to us as providing a method of illumination which will facilitate movement, minimize the risk of accidents, and assist in the speeding up of industrial production, while at the same time complying with the blackout regulations.

The fluorescent substance does not emit light when the exciting light is withdrawn. A wall, or the edge of a curb, covered with a fluorescent substance will spring into vivid brightness immediately the exciting light is turned on, and will be immediately extinguished on the extinction of that light. Here we have a valuable phenomenon completely under control, for use during the hours of darkness.

The fluorescent material is supplied in the form of a high-grade lacquer. This is applied over a special white coating. The lacquer possesses hard-wearing qualities and rapid drying properties and it requires no protective varnish or other treatment. It is claimed that it will stand up to a good deal of abrasion without losing its fluorescence. The white under-coating can be applied to any surface—brick, concrete, wood, metal, or fabric. The fluorescent lacquer contains no pigment, and can be subjected to much harder usage than road marking paint without any damage to its fluorescent properties. It is claimed, too, that its fluorescent properties do not vary greatly with temperature. The intensity of the fluorescence is governed by the amount of invisible radiation present—*i.e.*, given out by the filtered light—or the area of the surface treated.

Conjoint Conference of Public Utility Associations

The Tenth Annual Meeting of the Conjoint Conference of Public Utility Associations was held at Gas Industry House, Grosvenor Place, S.W. 1, on Wednesday, Jan. 28.

In the unavoidable absence of the President of the Conference, Lord Falmouth, the Chair was taken by the Vice-President, Sir David Milne-Watson, and in the course of the proceedings the Annual Report for the year 1941 was received and adopted.

In his Address to the Conference, which was read, the President referred to the magnitude and importance of the work which it had successfully carried out during a difficult year, and offered the thanks of the members to all those who had been responsible for its execution. As the Report shows, among many matters dealt with, three—coal, war damage, and post-war planning—were of major importance and engaged the close attention of the Conference during the year.

In regard to coal, the President pointed out that it was due in large measure to the efforts of the Public Utilities Coal Committee, which was set up by the Conference on the suggestion of the President of the Board of Trade, that the position in regard to supplies and stocks of coal required by gas, electricity, and water undertakings, which in the Spring and early Summer was causing serious anxiety, had been to a considerable extent remedied. The Report records that this Committee met regularly every week to confer with the principal Officials of the Mines Department, and was responsible for the allocation and delivery of coal to all undertakings, and for the settlement of disputes regarding the grade and quality of the coal supplied.

With regard to war damage, the President reminded the meeting that the Conference was still awaiting the further legislation dealing with public utilities which was promised when the War Damage Bill was introduced.

As the Report recalls, the Government were unwilling to accede to the request made by the Conference that public utilities should be outside the scope of the Bill in order that the subsequent legislation applicable to them might be comprehensive and free from cross-references. In consequence, the "land" of public utilities—which term, by reason of an amendment sponsored by the Conference, includes all the immovable plant owned by public utility undertakings—falls within the provisions of Part I of the War Damage Act.

Turning to national post-war planning and reconstruction, the President endorsed what was said in the Report regarding the great importance of having the Conference represented on the Central Planning Authority. The Report points out that the services which the utilities of gas, water, and electricity render to the population are indispensable, in both the industrial and the domestic spheres, and that by reason of the obligations placed upon them, and of their contact with the community at innumerable points, undertakings necessarily have both an intimate knowledge of, and a great interest in, all matters relating to social prosperity, social welfare, industrial and agricultural development, coal conservation, town and country planning, and the like.

Reference was also made to satisfactory effects of the truce to competition between gas and electricity which was established at the beginning of the war and is to continue for its duration, and the President expressed the personal opinion that it would be in the interests of all concerned if similar co-operation were to be maintained after the war is over.

Members learned with the deepest regret that Mr. William Cash had, on medical advice, felt it necessary to tender his resignation as Vice-President. Mr. Cash had been a member of the Conference since its inception and had done most invaluable work not only as Vice-President but as Chairman of the Conference. The Conference expressed its appreciation and thanks for all the help that Mr. Cash had rendered in the past and the hope that he would soon be completely restored to health.

The vacancy caused by Mr. Cash's resignation was filled by the appointment of Sir Francis Fremantle.

The meeting concluded with the unanimous re-election of Lord Falmouth as President, of Sir David Milne-Watson and Lord Pentland as Vice-Presidents, the election of Sir Francis Fremantle as Vice-President in place of Mr. Cash, and with the appointment of the Council of the Conference.

The meeting was followed by a meeting of the New Council, in the course of which Mr. A. E. Cornewall-Walker was appointed Chairman (it being the turn of the water interests to make the nomination), and the usual Standing Committees were set up.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

RECOVERY OF "PYRIDINE BASES" FROM COKE OVEN GAS*

By H. J. MEREDITH,

Chief Chemist, Koppers Company, Seaboard Division, Kearny, N. J.

CONSIDERABLE interest in pyridine has been aroused in the past two or three years which undoubtedly can be attributed to the spectacular success of sulphapyridine in the medical field. Enough of this drug can be made from the pyridine from one ton of coal to treat about three cases of pneumonia, so that the potential palliative from a coke plant carbonizing 3,000 tons a day would relieve the suffering of about 3,500,000 persons per year. It is doubtful therefore that the present demands for pyridine are entirely due to the medicinal requirements, and especially so when it is recognized that sulphapyridine has to compete with other drugs, such as sulphanylamid and hydroxymethyl apocuprein, &c. However, we were asked to recover "pyridine bases" from our gas to meet the increasing demand, and after making preliminary tests to find out how it could be done most economically, installed the continuous process described in this Paper.

The term "pyridine bases" was used in the title of this report to conform with popular terminology, but since they are only a fraction of the total bases and are often confused with pyridine itself, the expression "tar bases" has been adopted instead, and will be used in this Paper in connexion with any of the work done by the writer or his associates.

Tar Bases

The tar bases are a mixture of aromatic nitrogen-bearing ring compounds which are formed during the coking process either as primary products from the thermal decomposition of coal substance or as products of secondary reaction occurring in the gas. A complete list of those actually identified can be found in most text books on coal carbonization or tar distillation—*e.g.*, ([4], [5], [6]). They come over with the crude gas from the coke ovens, some condense out with the tar, and the balance remain in the gas. The latter are mainly the lower boiling fractions rich in pyridine and of special interest when this is in demand, since the pyridine in the tar is usually not readily available under present tar-refining methods.

Tar Bases in Tar.—The tar base content of tar varies from about 2 to 4%, depending on the source of the tar. Weiss and Downs ([7]) report 2.3% (mostly pyridine, picolines, lutidines, quinolines and acridine). Reilly Tar and Chemical Corporation([9]) give the following:

	% original tar.
Crude bases	2.0
Pyridine	0.1
Heavy bases	1.9
Total	4.0

From this the pyridine in the tar bases is seen to be 2.5%.

An analysis of the tar bases from tar was made by Wilson and Wells,([8]) who report:

Boiling range, °C.	Tar base isomer.	% of total bases.
	Pyridine	7
125–145	Picolines	10
145–170	Lutidines	7
170–180	Collidines	3
180–230	—	30
230–240	Quinolines	24
240–280	—	19
Total		100

In his Paper on "New Methods for the Recovery of Pyridine from By-Product Coke Plants," Dr. W. Klempt([10]) reports that, after a survey of the coke industry in the Ruhr district for 1938, a total of 900 metric tons of denaturing grade pyridine were available in the tar from the production of 38,000,000 metric tons of coke. Assuming a 70% coke yield and a yield of 10 gall. of tar (9.8 lb. per gall.) per ton, this is equivalent to about 0.034% of the tar by weight, and 0.033 lb. per ton of coal. Since these figures are for denaturing pyridine (distilling at least 90% below 160°C.), it is seen that the maximum actual pyridine recoverable from this tar is not more than about 0.01 lb. per ton, assuming that about 30% of the denaturing pyridine is pyridine. This is very much lower than what is reported for American coke oven tars.

On the basis of the data from Weiss and Downs, Wilson and Wells, and Reilly Tar, it is concluded that the total tar basis recoverable from tar amounts to an average of about 3.0 lb. per ton, of which 4 to 5% is pyridine.

Tar Bases in Gas.—The tar bases which remain in the gas can be recovered from the saturator liquor or, if the gas has not been previously scrubbed with water, from the light oil. The actual amount present, of course, would vary with local conditions. Wald ([3]) reports a recovery of from 0.15 to 0.20 lb. of crude bases per ton of coal. These contain from 50 to 60% tar bases, about half of which is pyridine. This indicates that the gas contains from 0.04 to 0.06 lb. of pyridine per ton of coal and probably represents the maximum recoverable from coke oven gas.

Uses for Tar Bases.—The tar bases are a source of the refined pyridine bases (denaturing pyridine), pyridine, and the picolines, all of which have a certain market value.

Refined Pyridine Bases.—These were used for denaturing alcohol in the United States until a few years ago, when they were replaced largely by other denaturants. They are still used in Europe, however, and until the war started, considerable quantities were exported for that purpose. The U.S. Internal Revenue Bureau Specifications for "Refined Pyridine Bases" contain the following requirements: "When 100 c.c. are subjected to the determination of the boiling point in the same manner as prescribed for wood alcohol, at least 50 c.c. must distil at 140°C., and at least 90 c.c. at 160°C."

Pyridine.—Pyridine is possibly the most important constituent of the tar bases and has various industrial uses as a solvent in the rubber, paint, and plastic industries. It is a starting material in organic synthesis of industrial and pharmaceutical chemicals, such as piperidine dipiperidyl, sulphapyridine, &c. It is used in making chemicals for waterproofing fabrics and leather, as an ingredient in insecticides, and as a catalyst in the manufacture of dyes and chemicals ([11], [12]).

The Picolines, &c.—There appears to be a market for the picolines, which in the past have been sold as part of the denaturing pyridine bases. As far as the writer is aware, there is no market for the higher boiling components of the tar bases.

Recovery of Tar Bases from Saturator Liquor

General.—In the "semi direct" process for manufacturing ammonium sulphate, the gas from the ovens after passing through indirect coolers and tar extractors is bubbled through a bath whose acidity is maintained at approximately 6% H_2SO_4 as determined by titration with standard sodium carbonate using methyl orange indicator. This gas contains all the ammonia produced and all the tar bases except those that condensed out with the tar and the small amount lost in the still waste. The "tar bases" remaining in the gas are mainly pyridine and its homologues, the higher boiling tar bases having condensed with the tar. The extent to which the saturator liquor removes these tar bases from the gas depends on the acidity, the temperature of the bath, and the amount present. Under normal conditions when no recovery of tar bases is made, the concentration in the liquor builds up to from 50 to 70 grammes per litre ([2], [3]), and what enters with the gas either leaves with it or deposits out with the ammonium sulphate.

When recovery is practised, the equilibrium between the gas and the saturator liquor is disturbed, and the concentration of the tar bases in the liquor is reduced to an amount which depends on the extent of the recovery. At about 20 grammes per litre ([2]) no pyridine can be found in the ammonium sulphate. This should be of special interest to producers who experience difficulty in manufacturing a suitable dry neutral salt, since the acidity of $(NH_4)_2SO_4$ resulting from drying will be greater when pyridine sulphate is present([13]).

If saturator liquor be withdrawn from the saturators at a rate of y gallons per minute for the removal of tar bases, the final concentration of tar bases in the liquor will reach a constant value, x grammes per litre, which is dependent entirely on y, and the production of tar bases P will be found from the expression—

$$P = \frac{(x)\ (3.785)\ (y)\ (60)\ (24)}{(454)}$$

$$= (12)\ (x)\ (y) \text{ lb. per day.}$$

To design a plant properly it is necessary to know the tar base content of the gas entering the saturators, the percentage recovery desired, and the concentration of tar bases in the liquor in equilibrium with the outlet gas. The equilibrium data are not easily obtained, and so the simplest procedure is to calculate how much saturator liquor can be neutralized by the vapours from the ammonia stills and design a plant to handle that amount. For example, the amount of liquor containing 60 grammes per litre of equivalent H_2SO_4 that can be neutralized in a coke plant producing 70,000 gall. of ammonia liquor (5 g.p.l. total NH_3) is about 11 gallons per minute. Actually, in the writer's opinion, most of the desirable tar bases can be obtained by treating about half this amount. According to Wald([3]) when 4 to 5 gallons per minute of saturator liquor are treated, the concentration of tar bases in the liquor is 1%. He does not state what percentage recovery this represents, but undoubtedly it would not pay to operate at a higher rate.

When we were asked to recover the tar bases from our saturator liquor

* From the *American Gas Journal*, November, 1941.

we were acquainted only with the old batch process used at the coke plant at Rainey-Wood, which appeared to be a modification of that used by Dodge and Rhodes[2]. It was apparent that the tanks, &c., required by the batch process would be expensive and would also occupy much more space than we had available, and furthermore the intermittent method was obviously inefficient with respect to the maximum recovery of tar bases. Wald[3] recognized this too, and reports that when a saturator bath contains about 5 or 6% tar bases, which it will after about three days' operation, the amount of tar bases removed from the gas will be equal to what deposits with the ammonium sulphate only.

Seaboard Procedure.—The tar bases are practically insoluble in neutral or alkaline solutions saturated with ammonium salts, so that to remove them from saturator liquor it is only necessary to neutralize it and remove the bases by distillation or separation by gravity. The natural neutralizing agent to use in a coke plant is the ammonia vapours from the crude ammonia stills, and one is confronted only with the choice of whether to neutralize the liquor with condensed or partially condensed vapours, or to treat the liquor with the hot vapours direct.

Preliminary Tests.—Tests were made to decide which of the above procedures was the better, and it was found that when saturator liquor is "steam distilled" with crude ammonia still vapours and the outlet vapours dephlegmated to a temperature of about 96°C., that the condensate separated readily into two layers. The upper layer contained the tar bases with about 15% water and the lower was an aqueous solution of ammonium carbonate containing negligible amounts of the tar bases. It was obvious from this that by controlling the reflux temperature, a simple continuous process could be installed for removing the tar bases on a plant scale which would yield a crude product containing no tarry matter, &c.

Operation of the Plant.—The liquor is removed from the drain tables intermittently about every two hours and discharged into a small lead-lined tank. It is pumped from this to the neutralizer at a rate of about 1.5 gall. per minute, where it is met by ammonia vapour from the stills. The flow of these vapours is maintained at such a rate that the effluent from the bottom is just alkaline to litmus paper. The dephlegmator on top of the neutralizer is operated so that the vapours leaving it are maintained at from 92°C. to 96°C. The condensed vapours flow into the separator and separate into two layers. The upper layer has a specific gravity of 1.002, contains all the tar bases, and is run continuously into drums. The lower layer, a strong solution of ammonium carbonate (sp. gr. usually about 1.03), containing practically no tar bases, is discharged to the ammonia liquor system. The continuous separation without preliminary salting out is possible only when the ratio of NH_3 to CO_2 in the vapour leaving the dephlegmator is such that the condensate contains enough ammonium carbonate to render the tar bases insoluble in it.

TAR BASES—(PYRIDINE EQUIVALENT).

Gas entering the saturators	20–30 grains per 100 cu.ft.
Gas leaving the saturators	10–15 " " "
Saturator liquor	40–50 grammes per litre.
Gas after the final coolers	0
Still waste	Trace.
Ammonium sulphate	0.07–0.18%.
Gas liquor	0.2–0.4 grammes per litre.

The effluent from the neutralizer is returned to the saturators and its acidity must be maintained within rather narrow limits. Ferrous sulphide and iron-cyanogen compounds precipitate out if it becomes alkaline and the removal of tar bases from the liquor is seriously reduced if it becomes too acid. It has been found that a pH of from 6 to 7 is about right, and this condition is maintained by testing with litmus paper and adjusting the rates so that the effluent liquor is just alkaline to red litmus.

The above procedure is suitable for the recovery of all the marketable tar bases and can be controlled to suit the existing market conditions. The apparatus is simple and can be constructed mainly from equipment usually found in any coke plant.

Tar Bases Produced.—We are carbonizing about 2,800 tons of coal per day and recovering approximately 1,400 gall. per month of *crude* tar bases having the following analysis:

Moisture	20–30% by volume.
Pyridine	25–30% "
Total tar bases	500–600 grammes per litre.

On the basis of this analysis, the actual tar bases present would contain about 50 to 60% pyridine.

RECOVERY PER TON OF COAL.

Crude tar bases	0.0168 gall.
Tar bases	0.070 lb.
Pyridine	0.042 lb.

Tar Bases in Gas, &c.—It is not possible by any simple procedure to analyze the plant products with respect to any single component of the tar bases, for to do so it would be necessary to recover enough of the crude bases for fractionation. We are able only to analyze for total tar bases and a result of a preliminary survey is shown in the adjoining table.

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OXIDE PURIFICATION—SOME WARTIME EXPERIMENTS*

By A. J. DORAN,

Chief Chemist, Edinburgh Gas Department

I AM privileged through the kindness of my Chief, Mr. Jamieson, to place before you a description of the experimental work, and the results obtained, carried out at our Granton Works during the past two years. Since the outbreak of war many problems intimately affecting our Industry have arisen, one of which, the supplies of purifying material, is of particular importance.

In normal times the source as far as we were concerned lay in Holland and Belgium. Transportation of this material obviously presented grave difficulties, and with the ultimate occupation of Holland by the Germans any possibility of supplies was eliminated. To an undertaking such as ours, whose annual requirements are in the region of 1,500 tons, a serious problem presented itself. Having a certain amount in stock the problem was not one of immediate concern, but it was obvious that the position would rapidly become serious. It was therefore decided to investigate the position with a view to the possible production of substitutes.

There were on the market at this time certain gas purification materials of which we had had no personal experience, but samples of some of these were obtained for laboratory experiments. In addition to these certain raw materials were available—viz., burnt spent oxide and by-product iron oxide from the purification of bauxite—which appeared to us worthy of investigation. Both these materials were readily available, and if the initial experiment proved successful large quantities could be procured within easy reach of the works. It was therefore decided to commence our investigations on the latter two products and samples were obtained. The by-product from an alumina works was received in two forms—viz., red sand and red mud. The latter sample was ruled out at once owing to its physical condition, it being found impossible to handle.

The two samples thus available were submitted to the action of crude coal gas, but in neither case was H_2S absorbed. The samples were rendered less resistant to the passage of the gas by the addition of sawdust, but again the results proved negative. With a view to speeding up the method of testing and to give better results, a test employing specially generated H_2S gas was employed. This test consisted in placing a suitable quantity of the purifying material, approximately 150 grammes, in a glass funnel, and H_2S gas was passed up through the mass until it was completely saturated with the gas. The material was then allowed to revivify and any temperature rise noted, the sulphur content being determined on approximately 10 grammes of the sample. This procedure we adopted as our standard laboratory test and each sample was submitted to five foulings, and

* From a Paper to the Scottish Junior Gas Association (Eastern District), Jan. 17, 1942.

an average sulphur content figure per fouling obtained, the results being reported on a dry basis.

A sample of Dutch bog ore submitted to this test yielded the following results :

1st Fouling	7.2%	Sulphur (dry basis).
2nd "	18.4%	" "
3rd "	21.6%	" "
4th "	29.0%	" "
5th "	32.2%	" "
Average per fouling	6.4%	" "

This result was taken as a fair average, and was used as our basic standard for further comparisons. In view of the fact that the two iron oxides available—burnt oxide and aluminium by-product—produced negative results when subjected to the test, attempts were made chemically to activate the apparently inert oxide. The first test consisted in taking the burnt oxide and treating it with H_2SO_4 in an attempt partially to dissolve the iron oxide and then precipitate the hydroxide on the remaining mass, using concentrated ammoniacal liquor. The results, however, were disappointing in that the material became very plastic and difficult to handle, so the experiment was abandoned. It was also realized that even if successful the cost of such a process would be prohibitive. The burnt oxide was next treated with concentrated ammonia liquor only, the material being dried and broken up and then submitted to the action of H_2S gas, but again the results were negative.

The next step was to mix a quantity of lime with the burnt oxide, and when this was submitted to the action of the H_2S gas the material at once blackened, accompanied by the evolution of heat. This result showing promise we proceeded to prepare a mixture consisting of 85% burnt oxide, 5% sawdust, and 10% lime, to which was added a suitable quantity of water. This mixture was submitted to our standard test with the following results:

1st Fouling	3.3%	Sulphur (dry basis).
2nd "	8.8%	" "
3rd "	8.8%	" "
4th "	8.8%	" "
5th "	8.8%	" "
Average per fouling	1.8%	" "

It would appear that following the second fouling the material became totally inactive and it certainly retained its black colour at this stage. The partial success attending this experiment raised the question in our minds, had the lime been the purifying agent, or had the lime activated the iron and after a time rendered it inactive by reason of its insolubility? This led us to try a simple soluble alkali, soda ash, and the following mixture was prepared: 80% burnt spent oxide, 10% sawdust, 10% soda ash, with a suitable quantity of water added. The following were the results obtained with this mixture:

1st Fouling	5.4%	Sulphur (dry basis).
2nd "	8.6%	" "
3rd "	10.9%	" "
4th "	13.9%	" "
5th "	19.1%	" "
Average per fouling	3.8%	" "

The results were considered extremely promising, and seemed to indicate that the solubility of the alkali was an important factor. It was thought at this stage that such a preparation might prove beneficial in conserving stocks of the natural ore, and with this end in view a further mixture was prepared consisting of 50% natural bog ore and 50% of the soda ash preparation. The results obtained on this occasion were:

1st Fouling	6.2%	Sulphur (dry basis).
2nd "	11.8%	" "
3rd "	17.1%	" "
4th "	22.6%	" "
5th "	25.2%	" "
Average per fouling	5.0%	" "

It will be seen that this figure agrees with the theoretical figure from the previous tests made on the separate products, thus confirming our test method.

Parallel tests were carried out, using the red sand from the Aluminium Company, but in every case the results were negative.

In view of the highly promising results, it was considered advisable to conduct investigations on a large scale using crude coal gas. For this purpose use was made of two small purifiers of our experimental plant. These purifiers measure 6 ft. by 6 ft. by 3 ft. 9 in. and are worked in series followed by a wet meter. The second purifier was filled with natural bog ore to act as a catch box, its purpose being merely to serve as a protection of the meter. It in no way plays any part in the actual experiment. The crude gas supply was drawn from the ammonia scrubbers. The material under test was of the following composition:

Burnt spent oxide	20 cwt.	= 80%.
Soda ash	2 "	= 8%.
Sawdust	3 "	= 12%.

The burnt oxide as received contained a quantity of water, approximately 30%, and after the material had been throughly mixed a further quantity of water was added, giving the material a gross weight of 1.4 ton with a moisture content of 41.3% and a density approximately equal to that of natural bog ore. This material was then filled into the box, and the experiment commenced. The initial gas rate was approximately 250 cu.ft. per hour. This figure was later increased to approximately 420 cu.ft. per hour in order to speed up the experiment and also to put the material under more rigorous conditions. Daily observations were made as to gas passed and H_2S content at inlet and outlet.

It may be of interest at this stage to describe the method employed for the determination of the H_2S. 150 ml. of the gas under slight vacuum is titrated with N/50 iodine solution, using a 0.1% starch solution as indicator. The amount of iodine used multiplied by 100 gives directly the H_2S content of the gas in grains per 100 cu.ft. For this method, which has been found very satisfactory, we were indebted to the Gas Light and Coke Company. The following table gives the results obtained:

Number of runs.	Gas passed (cu.ft.).	% sulphur (dry.)	% efficiency at the end of run.
1	132,000	3.8	64
2	502,000	12.2	80
3	324,000	16.3	100
4	903,000	32.0	74

Total gas passed = 1,861,000 cu.ft.

This experiment was commenced on Feb. 9, 1940, and concluded on Nov. 27, 1940. It was found necessary to close down during the first run at an earlier stage than was anticipated, due to the fact that for some unknown reason H_2S was passing the second box, thus endangering the meter. In runs 2 and 4 a similar occurrence caused the stoppage. In run 3 it was deliberately stopped in order to examine the material. Following the first run the oxide was black, but revivified in a very short time, the material being free from any lumps. The calculated sulphur content, from the daily observations, was 3.7%, as against the actual determined content of 3.8%. After the second run the oxide was very black, being somewhat slower to revivify and being accompanied by a considerable evolution of heat. At the end of run 3 the lower portion of the oxide only was blackened and revivification readily accomplished with little heat being evolved. At the end of the fourth and last run the oxide was again very black, but on being exposed to the air readily returned to almost its original colour with a fair quantity of heat evolved. An average temperature taken over the mass was 50°C. at the end of 3 hours' exposure to the atmosphere, and at the end of a further 3 hours the temperature was 45°C., the atmospheric temperature being 10°C. The theoretical sulphur content was 31% as against the actual figure of 32%. The moisture content of the material was 24.3%. During half the period of the last run an average efficiency of 100% was maintained and had only dropped to 74% when the run was stopped. The figures thus showed the remarkable activity of the material. The oxide was in good condition, free from any lumps and easily handled. As this result had largely confirmed our initial laboratory experiments it was decided to discontinue the experiment, as it was felt that the results had justified a trial on a large works scale. This meant the preparation of at least 120 tons, which is the normal capacity of our works boxes, and the following perparation was made:

Burnt spent oxide	54%	dry basis.
Soda ash	5.5%	"
Sawdust	9.5%	"
Water	31.0%	
	100 = 120 tons.	

To this mixture was added approximately 15 tons of Irish bog ore, which contained 64% of moisture, mainly to act as further opening material. The purifier section with which we are concerned consisted of six boxes, forward rotation being employed, three boxes being in operation, with one set box together with two catch boxes. The section deals approximately with 4 million cu.ft. per day. The following daily observations were made :

(1) Inlet and outlet H_2S content.
(2) Inlet and outlet temperatures.
(3) Inlet and outlet pressures.

The results to date may be summarized thus:

Run number.	Days working.	Percentage moisture at the end of run.	Sulphur. Wet.	Sulphur. Dry.	Tar. Dry.
1	82	28.2	12.4	17.3	0.5
2	67	23.5	25.0	32.7	1.7
3	69	7.8	40.5	44.0	2.7

The material has thus been in operation for a period of 218 working days. The total efficiency over the whole period averaged 84%, which must be considered a remarkably high standard. The period of runs and sulphur absorption have been very uniform. During the third run the moisture content shows how the temperature increase had dried up the oxide. At the end of the third run fully two-thirds of the material had caked strongly and required increased labour to remove it, picks being necessary. This, however, is not a feature of this material alone, as similar experience has occurred with natural bog ores, but possibly not so pronounced.

At this stage it was decided to discontinue the use of the material, as it was considered that improvements could be made in reducing the caking propensities by utilizing increased quantities of sawdust or sawdust of a coarser nature, or both. As the result of the sale of this material a good profit was shown on the transaction.

(To be continued)

NEW PATENTS

Electrical Precipitation

The Whessoe Foundry and Engineering Company, Ltd., and K. W. Francombe have been granted a patent (No. 540,918; application date, May 10, 1940) relating to electrical precipitation of suspended particles from gases. It is concerned with preventing, or at least limiting, swinging of the suspended electrode or electrode system of the gas-treating chamber.

One means of preventing or limiting the swinging movement of the suspended electrode is described in the specification of Patent No. 428,471.

The patentees state that while the prior arrangement is very satisfactory in practice, it may be difficult to employ it in connexion with gas treating chambers having collecting electrodes of the plate type—so-called "plate precipitators." The reason for this is that, while in the prior arrangement the rigid electrode was housed in a tubular collecting electrode of correspondingly larger diameter than that through which the flexible wire electrodes pass, in the case of plate type collecting electrodes if two plates were more widely spaced than the others to receive a rigid electrode, then all the other electrodes between these plates would have to be of the same diameter as the rigid electrode and of the same special construction as the latter; otherwise no corona discharge or insufficient or irregular corona discharge would be obtained. Generally speaking corona discharge is only obtained, in the case of plate precipitators, when a wire discharge electrode of relatively small diameter, not exceeding about $\frac{1}{4}$ in. and usually about $\frac{1}{8}$ in., is placed between parallel plates spaced between about 6 in. and 10 in. apart when normal precipitation voltages ranging from 25,000 to 60,000 are employed.

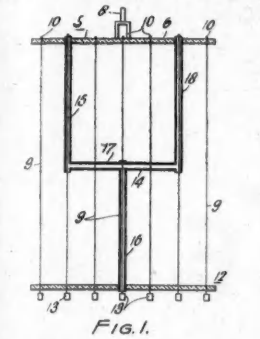

FIG. 1.
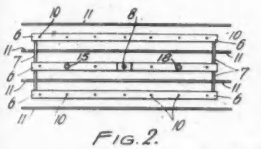
FIG. 2.

The invention comprises a precipitation plant having a plurality of flexible electrodes extending downwards from an upper suspension framework through precipitating chambers formed between plate electrodes to a lower framework, wherein a stiffening device has a portion which in part encloses or replaces one or more of the flexible electrodes over a part of the height of the precipitation zone, and another portion which in part encloses or replaces another or others of the flexible electrodes over another part of the height of the precipitation zone, the portions of the stiffening device being substantially rigidly connected to each other and to the upper and lower frameworks.

With this arrangement swinging is prevented or limited and yet the stiffening member does not affect the discharge properties of any one wire throughout the complete height of the precipitation zone. Consequently by-passing of dirty gas, which might occur if the discharge properties of one of the flexible electrodes were affected over the total height of the precipitation zone, is completely avoided.

Fig. 1 is an elevation of an electrode system incorporating one form of stiffening means in accordance with the invention, and fig. 2 is a plan of the electrode system shown in fig. 1.

The suspended electrode system illustrated comprises an upper suspension framework 5 consisting of a series of parallel elongated rectangular members or strips 6 connected together at their ends by cross pieces 7. The framework 5 is suspended in a gas-treating chamber (not shown) by means of a rod 8 from a suspension insulator (not shown) at the top of the gas-treating chamber, which is of rectangular cross-section, the arrangement being such that rows of flexible electrodes or wires 9 hooked on to each rectangular strip member 6, as indicated diagrammatically at 10, extend downwards through spaces or chambers between a series of parallel plates 11 located in the gas-treating chamber and forming the collecting electrodes. The rectangular strip members 6 of the upper framework are disposed parallel to and substantially midway between adjacent plates 11, as shown in fig. 2. At their lower ends the rows of flexible electrodes or wires 9 pass through a lower framework 12 and are tensioned by weights 13 as usual. A stiffening member 14 is provided in the plane of the centre row of flexible electrodes 9 or a plurality of members may be provided, say one for each row. In the construction illustrated a stiffening member 14 is provided only for the centre row of electrodes 9, as will be readily seen from fig. 2. The member 14 is preferably of tubular construction comprising a tubular portion 15 rigidly fixed, for example, to the central rectangular member 6 of the upper framework and extending downwardly around one of the flexible electrodes 9 for a distance equal, for example, to half the height of the precipitating zone—*i.e.* half the length of the flexible electrodes 9. It also comprises another tubular portion 16 rigidly fixed to the corresponding rectangular member of the lower framework 12 and extending upwardly around another of the flexible electrodes 9 of the same row for a distance equal, for example, to half the height of the precipitating zone. The two tubular portions 15 and 16 are rigidly connected by a substantially horizontal tubular portion 17 which, of course, lies between two plates 11 in the plane of the row of flexible electrodes 9.

Many different arrangements of the tubular portions of the stiffening member 14 may be employed.

Gas Producers

Among the new patents is one (No. 541,080; application date, May 9, 1940) taken out by Parkinson & Cowan (Gas Meters), Ltd., and K. R. Green. It is concerned with gas-producing plants of the kind wherein gas is abstracted from heated fuel by way of a perforated annulus.

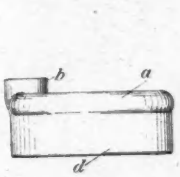

FIG. 1.

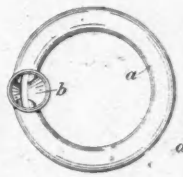

FIG. 2.

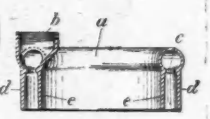

FIG. 3.

The patentees point out that in such gas producers, difficulty is frequently experienced in maintaining an uninterrupted flow of gas into and through the gas ring with wide fluctuations in the rate of abstraction of the gas. These difficulties are principally due to pieces of fuel rising with the gas from the bed and choking the openings through which the gas enters the ring. In severe cases of this kind, during high values of suction on the gas ring, drawing up of the fuel may be so extensive that the fuel in the bed may even become connected with the fuel sucked against the gas ring orifice or orifices by other drawn up fuel, so that when the suction on the gas ring is lowered the fuel does not fall from the gas ring and the flow of gas from the ring is seriously affected. The object of the invention, which is directed solely to gas producers of the kind wherein the drawing off head is of annular form, is the provision of means for obviating such disadvantages.

Fig. 1 shows in side elevation one convenient construction, figs. 2 and 3 respectively being plan and vertical sectional views. A gas collecting ring *a* is positioned above the heated fuel in a producer body (not shown), the ring being provided with an outlet duct *b* for the withdrawal of gas and an annular slot *c* in its lower surface for the collection of gas from the interior of the producer. Cylindrical shield members *d*, *e* extend downwards below the slot from the inside and outside respectively of the ring *a* to a distance a little more than the ring diameter.

In operation suction applied—*e.g.*, by an internal combustion engine—through the gas outlet duct *b* causes the usual mixture of air and water vapour to rise through the bed of heated fuel, the gas generated passing through the slot *c* and thence through the ring *a* into the gas outlet duct *b*, from which it passes through the usual cooling and cleaning apparatus to the engine.

The major part of the fuel which may be raised from the fuel bed by the suction is largely prevented by the shields *d*, *e* from reaching the slot *c*, and such pieces of material as do manage to reach the slot speedily fall when the suction is reduced—*e.g.*, by ceasing to draw gas into the engine—so that building up of a harmful heap of fuel particles beneath the slot is effectively prevented.

The patentees remark that for the most successful results the dimensions of the ring, the slot and the shields will vary for different sizes and types of producers and the respective dimensions may be varied within fairly wide limits even in the same producer, while the device is particularly useful in connexion with small portable producers such as are used for the provision of the charge for motor cars.

A Silver Jubilee

The British Gas Purifying Materials Company, Ltd., recently celebrated the Silver Jubilee of the formation of the Company. From modest beginnings during the third year of the last War, when the supply of purifying material was becoming an acute problem, the present conflagration finds the firm rendering an important service to the Gas Industry, for progressive developments have resulted in the production of a consistent oxide of a high quality, which is now being widely used on works throughout the country.

The shipping of Dutch bog ore was also conducted on an extensive scale up to the time of the German invasion of Holland during May, 1940, since when, after a survey of the sources available, Irish bog ore has provided an alternative, though to a somewhat limited degree. It is not surprising therefore to find a demand for an improved grade of material prepared from the recovered oxide after the extraction of the sulphur from spent oxide for acid-making purposes, and this is receiving considerable attention as a means of supplementing stocks of other oxides on hand.

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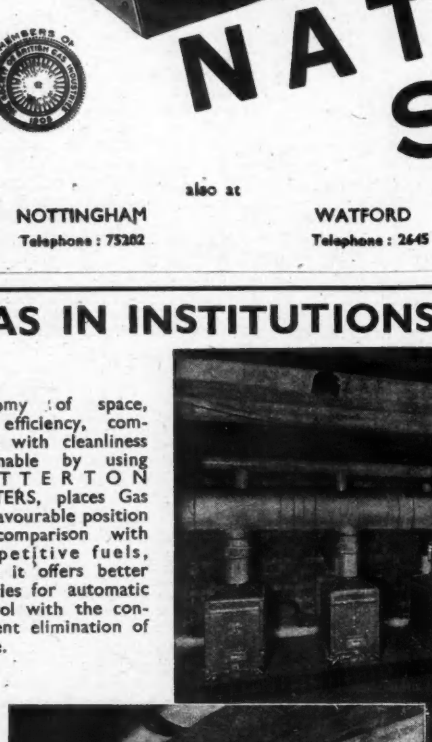

A photograph taken in the Heating Chamber of a new Hospital recently built for War-time requirements, eventually to be applied to the normal activities of the district. Twin "REX" gas-fired heaters having a combined output of 1,500,000 B.Th.U. hourly are provided for low pressure Hot Water Heating, while for Hot Water Service, the plant comprises triple "D" Series "REX" Domestic units, output 600,000 B.Th.U. hourly, with storage of 600 gallons. Floor space and flue capacity are provided for future extensions.

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Gas Products Prices

The London Market Feb. 2.

There is very little movement in the prices of Coal Tar Products, as many of the usual markets are no longer available and pitch/creosote mixture as a fuel oil has taken their place.

Pitch is still a nominal market, but for such quantities as are being sold the price ranges between about 45s. and 50s. per ton. Creosote is about 5d. to 6d. per gallon. With regard to refined tar the price for next season has not yet been definitely fixed and it is expected that this will come under a Direction to be issued by the Coal Tar Controller. Pure toluole remains 2s. 5d. per gallon under the Ministry of Supply Toluene No. 2 Order. Pure benzole is about 1s. 10d., 95/160 solvent naphtha is 2s. 5d. to 2s. 9d. and 90/160 pyridine remains about 13s. 6d. per gallon. All the above prices are *ex* Makers' Works. Naphthalene prices are unchanged and are in accordance with the Control of Tar Order 1941. The Order refers to maximum prices, and the figure for refined crystal naphthalene in 2-cwt. bags and 4-ton lots is £23 per ton delivered.

The Provinces Feb. 2.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4¼d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5¾d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland

GLASGOW, Jan. 31.

All prices steady. Refined tar 4¾d. to 5d. home and 4¼d. to 4½d. per gallon export. Creosote oil firm: Specification oil, 6d. to 6¼d.; low gravity, 6¾d. to 7¼d.; neutral oil, 6½d. to 6¾d. per gallon; all *ex* Works in bulk. Cresylic acid nominal. Pale 99/100%, 4s. 9d. to 5s. 3d.; Pale 97/99%, 4s. 3d. to 4s. 9d.; Dark 97/99%, 4s. to 4s. 3d. per gallon; all *ex* Works in buyers' packages. Crude naphtha 6½d. to 7d. Solvent naphtha: 90/160 grade 2s. per gallon and 90/190 Heavy Naphtha 1s. 9d. per gallon. Pyridines 90/160 grade 14s. and 90/140 grade 16s. per gallon.

Tottenham and District Gas Company Annual Meeting is to be held on Feb. 24, when final dividends will be recommended—on the Ordinary Stock 2½%, making 5% for the year; on the 5% Preference 2½%, making 5%; and on the 5½% Preference 2¾%, making 5½%. All less income tax.

Final Dividends are to be recommended to the Annual Meeting of the East Surrey Gas Company for the half-year ended Dec. 31 last—on Cum. Pref. stock 3%, making 6% for the year; on Red. Pref. Stock 2½%, making 4½%; on Pref. "A" stock 2¾%, making 5½%; on Ordinary "B" stock 2½%, making 5% for the year—all less income tax at 10s. in the £.

The Annual General Meeting of the Wandsworth and District Gas Company is to be held on Feb. 10, when dividends for the half-year ended Dec. 31, 1941, will be recommended at the following rates: On the 4% Preference Stock £2%; on the Consolidated Stock £2%. This will make a total dividend for 1941 of £4% in each case.

We have received a copy of the 57th Annual Statement of rates levied in various towns during the year 1941–42. This is compiled by W. Allison Davies, Borough Treasurer of Preston, and contains as usual a comprehensive list of charges for domestic supplies of gas and water in the various towns covered by the survey.

Members of The Institution of Gas Engineers are invited to attend a Joint Meeting of the Institution of Chemical Engineers and the Chemical Engineering Group of the Society of Chemical Industry, which is to be held on Tuesday, Feb. 10, at 2.30 p.m., in the Rooms of the Geological Society, Burlington House, Piccadilly, London, W. 1, when a Paper on "Design and Performance of Cooling Towers" will be presented by W. K. Hutchison, B.A., B.Sc., and E. Spivey, Ph.D.

An informal luncheon will be held prior to the Meeting at 12.45 p.m. for 1 p.m. at Stewart's Restaurant (corner of Piccadilly and Old Bond Street). The cost, exclusive of wines, will be 3s. 6d. per head.

Tickets for the Meeting can be obtained from the Secretary of The Institution of Gas Engineers, 1, Grosvenor Place, London, S.W. 1.

A Meeting of the Council of the Gas Research Board will be held at Gas Industry House on Tuesday, Feb. 10, at 10 a.m.

A Meeting of the Central Executive Board of the National Gas Council will be held in Committee Room No. 1, Gas Industry House on Tuesday, Feb. 10, at 1.30 p.m.

The Next Meeting of the Council of The Institution of Gas Engineers will be held on Tuesday, March 10, at 10 a.m.

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GAS STOCKS AND SHARES

Business in Gas stocks and shares was much more active last week than for some time past, and transactions were recorded over a large number of securities in the Official List. Prices continue to improve and of the many changes during the month of January all, with only one exception, were in an upward direction, Imperial Continental and Tottenham ordinary stocks and South Suburban 5% preference being particularly strong features. Last week was no exception to the general trend, as will be seen from the lists below.

Dividend announcements are now appearing and among these are the following: Cardiff 3% (6% for year—same), Tottenham 2½% (5% for year—same), Wandsworth 2% (4% for year—same), and Newcastle 2¾% (5½% for year—against 5⅜% for 1940). On the other hand, the Directors of the South Suburban Gas Company have increased the final distribution from 1% to 2%, making 4% against 3% for the year.

The following price changes took place during the week:

PROVINCIAL EXCHANGES

Bath Cons.	96—98	+2
Bristol Ord.	97—99	+1
Liverpool 5 p.c. Pref.	99—101	+3½
Sunderland Ord.	111—112	+3
Weston-Super-Mare Ord.	88—92	+2½
Ditto 4 p.c. Deb.	85—90	+5

OFFICIAL LIST

Alliance & Dublin Ord.	92—97	—1
Associated Gas & Water Undertakings Ord.	14/6—15/6	+-/3d.
Gas Light Units	13/6—14/6	+-/3d.
Ditto 3 p.c. Deb.	77—82	+2
Imperial Continental 3½ p.c. Deb. ...	82—87	+2
Southampton Ord.	55—60	+5
Tottenham Ord.	77—82	+2
United Kingdom 4½ p.c. 2nd Non-Cum. Pref.	14/—16/-	+-/6d.
Wandsworth Cons.	72—77	+2

SUPPLEMENTARY LIST

Reading 4 p.c. Deb.	90—95	+12

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 29.
1,767,439	Sept. 15	7	6	Alliance & Dublin Ord. ...	92—97
374,000	Dec. 29	4	4	Do. 4 p.c. Deb.	95—100
957,608	Nov. 10	5	5	Assocd. Gas & Water U'd'ts Ord.	14/6—15/6
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	14/—16/-
336,646	,,		4	Do. 4 p.c. Irred. Cum. Pref.	9/6—11/6
561,370	Aug 18		7	Barnet Ord. 7 p.c.	117—122
300,000	Oct. 27	1/4⅜	1/9⅜	Bombay, Ltd.	21/6—23/6
690,407	Aug. 25	7	7	Bournemouth 7 p.c. max. ...	118—123
362,025	June 16	4	4	Do. 4 p.c. Deb. ...	90—95
659,955	Oct. 20	4⅜	2½	Brighton, &c., 5 p.c. Con. ...	60—65
855,000	Sept. 22	6	6	Brit. Gas Light Ord.	71—76
545,000	Dec. 15	5½	5½	Do. 5½ p.c. 'B' Cum. Pref	105—115
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	75—80
10,000	Nov. 6 '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	½—¾
626,860	July 21	6	4	Cardiff Con. Ord.	95—100
24,500	Sept. 29	7	7	Colombo 7 p.c. Pref.	19/—21/-
764,169	Sept. 29	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/—16/-
400,000	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	19/—21/-
1,748,935	July 22 '40	2	3	Commercial Ord.	31—36
620,000	Dec. 8	3	3	Do. 3 p.c. Deb.	55—60
286,344	Aug. 18	5	5	Do. 5 p.c. Deb.	87—92
807,560	Aug. 11	6	6	Croydon sliding scale	92—97
644,590	,,	5	5	Do. max. div.	80—85
620,385	Dec. 29	5	5	Do. 5 p.c. Perp. Deb. ...	99—104
179,500	Aug. 18	5	5	East Surrey 'B,' 5 p.c.	65—70
176,461	Dec. 15	5	5	Do. 5 p.c. Deb. (Irred.)...	90—95
250,000	Nov. 10	6	4	Gas Consolidation Ord. 'B' ...	13/6—14/6
250,000		4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6
19,122,910	July 29 '40	3⅜	4½	Gas Light & Coke Ord. ...	13/6—14/6a
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	45—50
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	65—70
2,993,000	July 8 '40	3½	3½	Do. 3½ p.c. Red. Pref. ...	67—72
8,602,497	Dec. 1	3	3	Do. 3 p.c. Con. Deb. ...	77—82
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	103—107
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	102—105
700,000	Sept. 8	3½	3½	Do. 3½ Red. Deb. ...	83—88
5,600,000	May 13 '40	4	8	Imperial Continental Cap. ...	60—65
43,820	Jan. 26	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87
231,978	Aug. 25	5	5	M.S. Utility 'C' Cons.	70—75
918,657	,,	4	4	4 p.c. Cons. Pref.	75—80
675,000	Nov. 10	†4	†4	Montevideo, Ltd.	63—68
300,000	Dec. 15	7	9	Oriental, Ltd.	113—118
368,537	July 14	6½	3½	Plymouth & Stonehouse 5 p.c.	65—70
621,667	Aug. 18	7½	7½	Portsmouth & Gosport Cons.	87—92
648,999	Sept. 8	1/1	1/1½	Severn Val. Gas Cor. Ld. Ord.	16/—18/-
597,972	,, 8	-/10⅝	-/10⅝	Do. 4½ p.c. Cum. Pref. ...	16/6—18/6
2,528,714	Aug. 25	1/	7½	South East'n Gas Cn. Ld. Ord.	13/6—14/6
1,000,000	,,	-/10⅜	-/10⅜	Do. 4½ p.c. Red. Cum. Pref.	14/6—16/6
1,068,869	,,	4	4	Do 4 p.c. Irred. Cum. Pref.	12/—14/-
6,709,895	Aug. 5 '40	4	4	South Met. Ord.	48—53
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref.	75—80
850,000	,,	4	4	Do. 4 p.c. Irred. Pref.	60—65
1,895,445	Dec. 29	3	3	Do. 3 p.c. Perp. Deb.	70—75
1,000,000	Jan. 12	5	5	Do. 5 p.c. Red. Deb.	100—105
1,543,795	Sept. 8	4	2	South Suburban Ord. 5 p.c ...	61—66
512,825	,,	5	5	Do. 5 p.c. Perp. Pref. ...	82—87
500,000	,,	4	4	Do. 4 p.c. Perp. Pref. ...	65—70
250,000	,,	3¾	3¾	Do. 3¾ p.c. Red. Pref. ...	80—85
888,587	Dec. 15	5	5	Do. 5 p.c. Perp. Deb. ...	98—103
750,541	Aug. 18	5	2	Southampton Ord.	50—55
350,000	,,	5½	5½	Swansea 5½ p.c. Red. Pref. ...	88—93
1,076,495	,,	5	5	Tottenham & District Ord. ...	77—82
338,555	,,	5	5	Do. 5 p.c. Pref.	82—87
453,380	Dec. 8	4	4	Do. 4 p.c. Perp. Deb. ...	82—87
1,247,505	Dec. 1	4	‡4	U. Kingdom Gas Cor. Ord. ...	13/6—15/6
1,085,952	Nov. 17	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	15/—17/-
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum.Pref.	14/6—16/6
745,263	June 16	4½	4½	Do. 4½ p.c. 2nd Non.Cum. Pf.	14/—16/-
1,200,000	Sept. 22	3½	3½	Do. 3½ p.c. Red. Deb. ...	86—91
380,608	Aug. 18	7	6½	Uxbridge, &c., 5 p.c.	85—90
1,371,138	Sept. 1	4	4	Wandsworth Consolidated ...	72—77
2,525,768	,,	4	4	Do. 4 p.c. Pref.	68—73
1,343,964	Dec. 15	5	5	Do. 5 p.c. Deb.	99—104
383,745	,,	4	4	Do. 4 p.c. Deb.	79—84
588,342	Aug. 25	5	5	Watford & St. Albans Ord. ...	85—90
300,000	Dec. 8	3½	3½	Do. 3½ p.c. Red. Deb. ...	84—89

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 29.
351,685	Dec. 15	5	5	Brighton, &c., 5 p.c. Perp. Deb.	93—98
28,700	,,	5½	5½	Do. 5½ p.c. Red. Deb. 1942 ...	95—100
415,250	,,	4	4	Bristol Gas Co., 4 p.c. New Deb.	95—100
140,205	Aug. 5	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	105—110
295,932	Aug. 18	5	5	Cheltenham, 5 p.c. Cons.Ord....	85—90
42,500	Dec. 15	4	4	Do. 4 p.c. Perp. Deb....	75—80
150,000	Aug. 11	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	68—73
130,000	Dec. 29	4	4	Do. 4 p.c. Deb. ...	80—85
146,700	Aug. 18	5½	5½	East Surrey, 5½ p.c. Pref. 'A' ...	85—90
53,220	,, 19	6	6	Do. 6 p.c. Cum. Pref. ...	90—100
...	Aug. 19 '40	6	4	Eastbourne, 'B' 3½ p.c....	35—40
239,135	Nov. 17	5	5	Gas Consolidation 'A' Ord. (£1)	11/6—13/6
156,600	Aug. 18	5	5	Hampton C't, 5 p.c. Cons. Ord.	75—80
18,000	Dec. 29	3½	3½	Malta & Med 'n., 7 p.c. 1st Pref.	50—60
10,845	,,	3½	3½	Do. 7½ p.c. 2nd Pref.	40—50
50,000	Aug. 25	£5 19 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	60—70
65,000	Aug. 18	5	5	North Middlesex, 5 p.c. Pref. ...	75—80
70,000	Sept. 8	5	5	Plymouth & Stone., 5 p.c. Deb.	83—88
76,501	Dec. 29	4	4	Reading, 4 p.c. Perp. Deb. ...	90—95
74,777	Sept. 30	4	4	Romford, 4 p.c. Debs. (Reg.) ...	77—82
21,000	June 9	5	5	Slough, 5 p.c. Perp. Deb. ...	87—92
211,740	,, 16	5	5	Southampton, 5 p.c. Red. Deb.	95—100
363,575	Jan. 2	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	97—102
202,019	—	—	—	Tunbridge Wells, 4 p.c. Scale ...	90—100
135,257	Dec. 8	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	97—102

PROVINCIAL EXCHANGES

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 23.
804,948	July 28	5	5	Bath Cons.	96—98
122,577	July 28	6	6	Blyth 5 p.c. Ord.	100—105
1,667,250	July 21	5	5	Bristol, 5 p.c. max.	97—99
120,420	Dec. 15	4	4	Do. 1st 4 p.c. Deb.	100—102
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	97—99
328,790	,,	5	5	Do. 5 p.c. Deb.	109½—112½
157,150	Aug. 5	6½	3	Chester 5 p.c. Ord.	96⅔—99⅔
92,500	Dec. 15	4	4	Do. 4 p.c. Pref.	77—79
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	77½—82½
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	91—95
542,270	Aug. 11	9	6	Derby Cons.	98—103
55,000	Dec. 16	4	4	Do. 4 p.c. Deb.	75—80
10,000	Aug. 11	10	10	Great Grimsby 'A' Ord. ...	155—165
6,500	,,	10	10	Do. 'B' Ord. ...	155—165
79,000	,,	10	10	Do. 'C' Ord. ...	145—155
732,000	Aug. 25	4	4	Hartlepool G. & W. Cn. & New	61—63
2,167,410	Aug 18	6	6	Liverpool 5 p.c. Ord.	101½—103½
245,500	Dec. 15	5	5	Do. 5 p.c. Red. Pref. ...	99—101
306,083	July 15	4	4	Do. 4 p.c. Deb.	98—100
20,000	June 23	5	5	Long Eaton 5 p.c. Pref.	9—11
80,000	,,	5	5	Do. 5 p.c. Deb.	87—92
2,430,267	July 28	5⅜	5	Newcastle and Gateshead Con.	18/6—19/-a
682,856	,,	4	4	Do. 4 p.c. Pref.	84½—85½
776,706	June 30	3½	3½	Do. 3½ p.c. Deb.	83—84
277,285	Nov. 3	5	5	Do. 5 p.c. Deb. '43 ...	99—101
274,000	March 17	5	5	Newport (Mon.) Ord.	86—89
13,200	Sept. 16	8⅜	7	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½
13,600	,,	6	5	Do. 7 p.c. 'B'	9½—10½
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½
106,280	Aug. 11	10	10	Preston 'A' 10 p.c.	155—165
188,219	,,	7	7	Do. 'B' 7 p.c.	113—123
1,806,339	Aug. 25	6½	6½	Sheffield Cons.	120—125
95,000	Jan. 5	4	4	Do. 4 p.c. Deb.	96—99
332,351	Sept. 8	6	6	Sunderland 6 p.c. max. ...	111—112
192,150	Aug. 11	5	5	Weston-super-Mare Cons. ...	88—92
64,338	Jan. 5	4	4	Do. 4 p.c. Deb.	85—90
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	135—140

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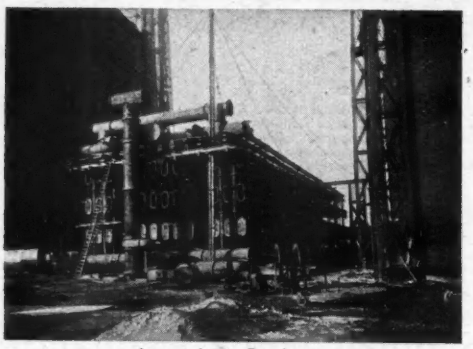

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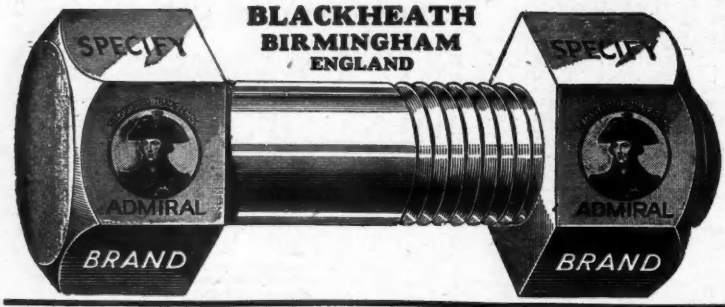

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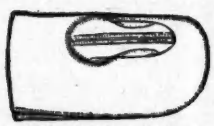

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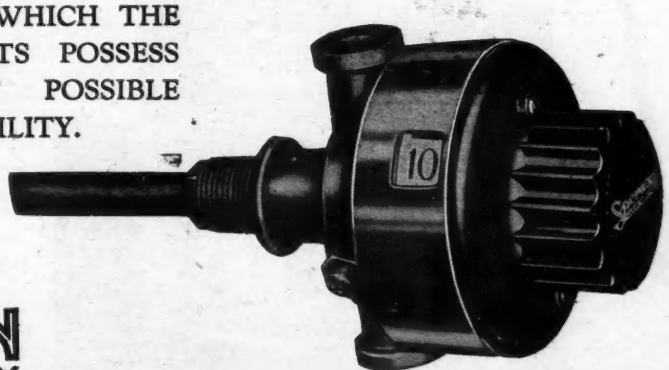

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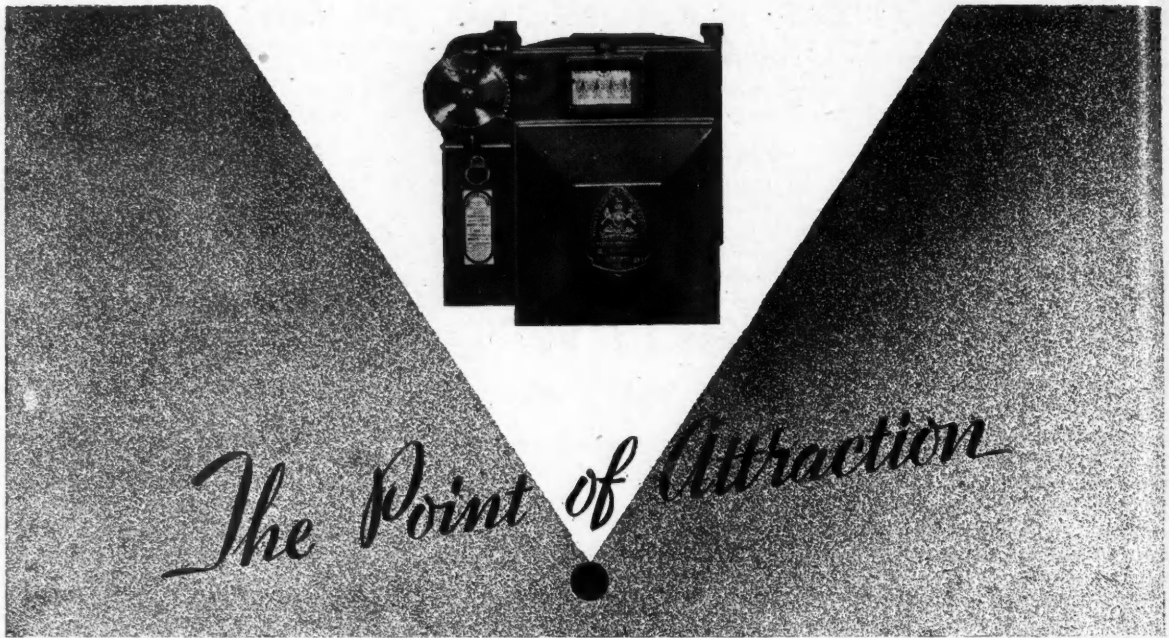

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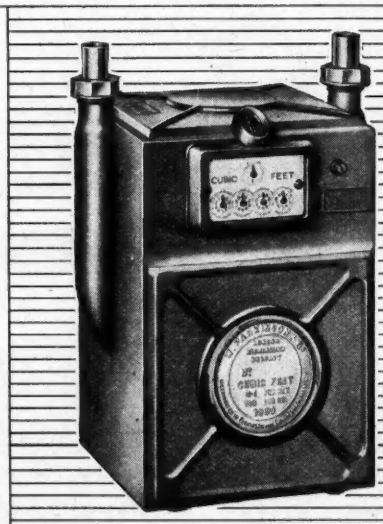

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